

 **steer davis gleave**

**HATCH**

**Surrey Newton Guildford  
Line**

**Environmental and  
Socio-Economic Review**

**Terms of Reference**  
March 2018



City of Surrey

JV ref: 350135-EV-230-A0-0004

Client ref: MT01701P



Prepared by:





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## Abbreviations

A list of the acronyms and abbreviations used in the TOR is below.

BC	British Columbia
BCEAA	<i>British Columbia Environmental Assessment Act</i>
CEA Agency	Canadian Environmental Assessment Agency
CEAA 2012	<i>Canadian Environmental Assessment Act 2012</i>
EAO	British Columbia Environmental Assessment Office
GHG	greenhouse gas
LRT	light rail transit
SNG	Surrey Newton-Guildford Line
OMF	Operations and Maintenance Facility
PPHPD	Passengers per Hour per Direction

## Preface to the Terms of Reference

TransLink and the City of Surrey are proposing to develop the Surrey Light Rail: Newton-Guildford Line (SNG) Transit Project (the Project), which will connect the communities of Newton and Guildford, to Surrey Central and TransLink's existing SkyTrain Expo Line. The Project will run along 104 Avenue between Guildford Mall and King George Boulevard, and then along King George Boulevard between Surrey Central and Newton Station.

This Terms of Reference (outlines the methods and content for the SNG Environmental and Socio-economic Review of the Project. It has been developed to reflect TransLink's desire to have an Environmental Review completed for the project. The Environmental Review process, technical data reports and Environmental Review Report and the public and First Nations engagement processes will support Project planning. The Environmental Review will also provide technical information to the construction procurement process, and is intended to support Project due diligence and transparency.

## Proponent

### South Coast British Columbia Transportation Authority

The mailing address for TransLink is:

400-287 Nelson's Court  
New Westminster, BC V3L 0E7

Website Address: <http://www.surreylightrail.ca/>

All communication regarding the Project should be sent to:

Project email: [surreylrt@translink.ca](mailto:surreylrt@translink.ca)

## Regulatory Backgrounder

The Project will be a street running light rail project shorter than 20 kilometres and therefore is not considered reviewable under either the *British Columbia Environmental Assessment Act (BCEAA)* or the *Canadian Environmental Assessment Act 2012 (CEAA 2012)*. Both the British Columbia Environmental Assessment Office (EAO) and the Canadian Environmental Assessment Agency (CEA Agency) have confirmed in writing their decisions not to review the Project under either *BCEAA* or *CEAA 2012*.

Notwithstanding the EAO and CEA Agency's decisions, given the importance of the Project to community development and to provide for transparent process that takes into account public and stakeholder interests, TransLink is undertaking an Environmental Review of the proposed Project.



## Project Overview

The Project is a light rail transit (LRT) line that will connect Surrey’s Newton and Guildford communities to Surrey Central and the existing SkyTrain Expo Line. The Project will run west from 152nd Street in Guildford along 104 Avenue to City Parkway, south along City Parkway to 102 Avenue, east along 102 Avenue to King George Boulevard, and then south along King George Boulevard to the Newton terminus near 71 Avenue and 136b Street. Figure 1 illustrates the alignment of the SNG LRT project, identified as Phase 1. A proposed Phase 2, which would involve an extension of the LRT system from King George Station to Langley City is not considered within this Environmental Review.

The principal Project components include LRT alignment and guideways, LRT stops, an operation and maintenance facility (OMF), a power, control and communication system and LRT vehicles. Figure 1 illustrates the Project alignment.



Figure 1: Surrey Newton Guildford Project Alignment



## **LRT Alignment and Guideway**

LRT guideways will generally be located along the centre of 104 Avenue and King George Boulevard. The guideway will consist of two at-grade LRT tracks approximately 7.3 m wide on 104 Avenue and 7.9 m wide on King George Boulevard. Roadway alignments will be widened and/or re-configured to accommodate the LRT guideway, as well as general purpose traffic, (i.e. vehicles), bicycles, and pedestrians. While the LRT guideway will be at grade it will be separated by a curb from general purpose vehicle lanes. Other than at major road crossings, general purpose traffic will not be permitted on the guideway.

### *104 Avenue*

Accommodating the LRT along 104 Avenue between the Guildford terminus and King George Boulevard will require a reduction of the number of general purpose traffic lanes from four to two. The re-configured roadway will include sidewalks and boulevard. The minimum width of the lane will be 4.5 m for the single lane and 3.3 m for double lanes.

### *King George Boulevard*

King George Boulevard currently has six general purpose traffic lanes between 102 Avenue and 96 Avenue, and four or five general purpose traffic lanes at other segments between 96 Avenue and 72 Avenue. Accommodating the LRT will require reconfiguration of general purpose traffic lanes to four between 104 Avenue and 72 Avenue. The re-configured roadway will include raised bike lanes adjacent to the sidewalk, separated by a boulevard.

## **LRT Stops and Exchanges**

The line will have 11 stops. Seven regular LRT stops and four stops linked to transit exchanges will be constructed at grade and will include side platforms to allow passengers to exit facing traffic, or centre platforms located between tracks. Platforms will initially have a length of 40 m, extendable to 60 m. Side platforms will be 3.6 m to 4.0 m wide, while centre platforms will be 5.0 m to 7.2 m wide. The transit exchanges at Guildford, King George, Surrey Central, and Newton, will connect SNG LRT to SkyTrain and buses.

## **Operations and Maintenance Facility**

A stand-alone Operations and Maintenance Facility (OMF) will be located in Newton, near the southern terminus of the Project near King George Blvd. It will include a control and administration building, maintenance building, operator's facility, service pits, traction power substation, and yard track. The OMF will also have perimeter fencing, roadways, and a staff vehicle parking area.

## **LRT Vehicles**

The design of the LRT vehicles has yet to be finalized, but are anticipated to be articulated single unit vehicles approximately 30 metres (m) long, each with a capacity of approximately 200 passengers (Figure 2)

## Power, Control, and Communications System

The LRT vehicles will be powered by direct current (DC) motors, supplied by an overhead catenary system supported by poles. DC power will be supplied from eight one-megawatt sub-station units, connected via high voltage power connections to the BC Hydro distribution system. Light rail transit vehicles will be driver operated, facilitated by radio communications and signalling systems. Signalling systems will include track crossing warning systems, track switching systems, and traffic light control interface. Communications systems include communications cables, telephone and radio systems, as well as a Supervisory, Control, and Data Acquisition system.



Figure 2: Potential Design of LRT Vehicles

## Infrastructure Requirements

The LRT system will be powered by electricity supplied by BC Hydro, via existing or new dedicated distribution lines.

## Construction Activities

The main construction activities associated with the Project include site preparation and roadwork; construction of guideway, stops and stations, and the OMF; installation of utility and operating systems; and commissioning. Table 1 summarizes the scope of construction work.

The Project will also be undertaking some Early Works in 2018 and 2019 that are funded by Phase 1 of the Public Transit Infrastructure Fund. This includes the City of Surrey undertaking permitting, consultation and construction of completing some utility relocations, and the replacement of the Bear Creek Bridge. TransLink will also be upgrading the Guildford Bus Exchange.

**Table 1: LRT Construction Activities**

Category	Components
Management, Design, and Engineering	Project management; planning; architectural, civil and systems engineering; procurement; systems integration; cost, quality, schedule, and environmental control
Traffic Management	Implementation of traffic measures, including roadway diversions, signage, traffic control, temporary lane closures, temporary access closure, temporary road and lane closure
Utility relocation	Relocation of buried and overhead utilities (e.g., electricity, telecommunications, municipal utilities)
Site preparation	Ground improvement, demolitions, culvert extensions, replacement of Bear Creek Bridge, lowering of guideway under Guildford Mall overhead connector
Environmental Mitigation	Implementation of environmental mitigation measures, which may include but are not limited to: contaminated material removal, fish habitat compensation, installation of noise attenuation measures, landscaping
Roadworks	Widening and alteration of roadways to accommodate transit way, including removal/resurfacing of roads, medians, and sidewalks; installation of drainage upgrades; replacement of street lights and pedestrian/traffic signalling systems
Transitway/Guideway	Installation of reinforced concrete transitway with trackwork, segregated from vehicle traffic by median curbs, including track switches and crossovers
System structures	Installation of substation buildings, overhead traction power lines, and power distribution/communications ducts
Exchanges and stops	Construction of platform structures, equipment kiosks, platform drainage, lighting, access ramps, traffic calming paving and curbs, safety barriers, service connections. Installation of station facilities, such as bike lockers, signage and furniture, public art, station security and emergency power systems, and flare connection systems
OMF	Construction of OMF buildings, including service pits, yard track, perimeter fencing
Power distribution, signalling, communications, and controls	Installation of overhead power supply catenary system, substations, high voltage connections, and low voltage power distribution systems; instalment of wayside communication and signalling systems, installation of communications and control systems
Testing and commissioning	Testing and commissioning of system

## Operations Activities

Once operational, the Project will replace the B-Line bus transit service along 104 Avenue and the King George Boulevard between the Guildford and Newton terminals. Because of the quicker travel time, increased vehicle frequency, and improved rider experience, the Project is expected to increase transit mode share within central Surrey.

### *Operating Route*

The SNG LRT is 10.5 km in length and runs along King George Boulevard from the Newton Transit Exchange to Surrey City Centre, and along 104 Ave from Surrey City Centre to the Guildford Transit Exchange. The system has a predicted average runtime of approximately 24.5 minutes end to end with 2.5 minutes of total dwell time at stops for a total of approximately 27 minutes.

### Operating Parameters

The LRT will operate “right hand running” to match the typical street operation, and in exceptional cases the system may operate with Light Rail Vehicles (LRVs) on a single track where the other track is impassable.

Table 2 shows a summary of the operating parameters for the LRT system configuration on opening day. The system will be capable of expansion to accommodate ridership predicted in 2045.

**Table 2: SNG LRT Operating Parameters**

	Opening Day Metrics
Total Fleet	16 vehicles <sup>1</sup>
System Capacity <sup>2</sup>	2,040 pphpd <sup>3</sup>
Load Standard Average	4 pass/m <sup>2</sup>
LRV Length	30 m
Minimum Headway	5 minutes
Stop Dwell Time	14 to 24 seconds
Total Stop Dwell Time	2.5 minutes
Travel Time	27 minutes
Average Operational Speed	25-35 km/hr
Maximum Line Speed	50 km/hr (generally based on traffic speed limit)
Power Pickup	Overhead Catenary
Gauge	1,435 mm
<b>NOTES:</b>	
<sup>1</sup> 30 m SNG vehicles can double capacity to 2 vehicles per train (60 m total)	
<sup>2</sup> For system capacity, TransLink Planning uses a factor of 0.85 relative to vehicle capacity (based on 4 pass/m <sup>2</sup> )	
<sup>3</sup> Calculation for 30 m LRV system capacity = 200 pass/trip x 0.85 x 12 trips per hour per direction = 2,040 passengers per hour per direction (pphpd)	

### Line Capacity and Ridership

Ridership on opening day in 2023 is estimated to be 3,300 boardings during the AM Peak hour (or 36,000 daily boardings). Daily ridership is predicted to average 53,000 by 2030 and 74,000 by 2045. Newton, King George, Surrey Central and Guildford stops show the highest boardings/alightings as these stops serve as key transit exchanges. Table 3 shows the forecasted ridership summary from opening day in 2023 up to 2045. The PM peak load has been scaled based on existing 96-B Line observed data.

**Table 3: Surrey-Newton-Guildford LRT Line Ridership Summary**

	2023	2030	2045
AM Peak Boardings	3,270	3,900	5,470
Daily Boardings	36,200	53,000 (51,000-55,000)	74,000 (71,000-77,000)
AM Peak Load (pphpd)	900	1,080	1,450
PM Peak Load (pphpd)	1,250	1,500	2,030

Compared to the 96 B-Line, the SNG LRT provides a faster service with higher frequency. Though the 96 B-Line has an end to end run time of approximately 30 minutes today, it is forecasted to slow down significantly in the future due to growing traffic congestion. In 2045, the LRT is forecasted to triple the route ridership when compared to the 2045 96 B-Line ridership

#### *Maintenance and Renewal*

Ongoing maintenance of the Project will occur at regular time intervals and as-needed throughout operation. These activities include servicing LRT vehicles and tracks, and maintaining stops, station buildings, and the OMF.

#### *Connection with Other Modes of Transport*

Once operational, the Project will replace existing B-Line bus service that currently operates between Guildford Mall and Newton along 104 Avenue and King George Highway. Terminal stations at Guildford and Newton will provide bus connections to destinations in Fraser Heights, Langley, South Surrey, and White Rock. The Project will connect to the SkyTrain at King George Station and Surrey Central Station.

The Project will be expandable to include an LRT line running between King George Station and Langley City, along Fraser Highway (Phase 2).

The Project alignment will be designed to enhance pedestrian experience by maintaining and improving sidewalks along alignment routes; providing safe access to LRT stops, through the use of signage, crossings, and lighting; providing shelters and street furniture at LRT stops; and increasing the frequency of transit service. The Project will maintain and enhance current bicycle lanes along King George Boulevard.

The proposed Project scope does not include park and ride facilities although it will be connected to the Scott Road Park and Ride facility via SkyTrain.

#### **Project Schedule**

An overview of the anticipated Project schedule is shown in Figure 3. The Project is currently in the procurement readiness stage. During this phase, engineering and planning activities are underway to support preparation of a detailed business case for the Project.

Environmental baseline studies began in February 2016, and continued through the Fall of 2017. The Environmental and Socioeconomic Review is planned for public review in mid-2018.

If funding from federal, provincial, and regional governments is secured as planned in 2018, construction could begin as early as mid-2019. Construction and commissioning are expected to take three to five years.

The Project is anticipated to be in operation for 30+ years, with major maintenance and upgrading after approximately 20 years. Electric tram and streetcar systems in Europe have been operating continually for well over 100 years, indicating that with periodic maintenance, an LRT system can be operated indefinitely. As such, there are currently no plans for Project decommissioning.

Key Project Activities	2017	2018	2019	2020	2021	2022	2023	2024
Aboriginal Group Engagement	Green	Green	Green	Green	Green	Green	Green	Green
Stakeholder, Agency and Public Engagement	Green	Green	Green	Green	Green	Green	Green	Green
Environmental Baseline Studies	Yellow							
Environmental and Socioeconomic Review	Yellow	Yellow						
Permitting and Environmental Management Plans		Yellow						
Engineering Studies	Yellow	Yellow	Yellow					
Construction			Blue	Blue	Blue	Blue	Blue	
Commissioning							Dark Blue	
Operation							Purple	Purple

Figure 3: Project Schedule for the Newton-Guildford Line

# Executive Summary

The Executive Summary will summarize the results of the analysis of Project-related effects; provide conclusions on the overall effects of the Project on the natural and human environment; and summarize the results of engagement with First Nations, the public, and stakeholders.

## 1 Introduction

The introduction of the Environmental Review will describe:

- The purpose of the Project, and identify how the objectives of the Project are related to broader private or public sector policies, plans, or programs.
- The location of the Project and include maps showing regional context.
- the relevant background on the Project, including exploratory or investigative studies, and Project alternatives reviewed.

## 2 Project Description

This section of the Environmental Review Report will:

- Identify and provide Project contact information
- Identify and describe Project components
- Describe all phases of the Project, including Project delivery and the duration and proposed schedule for construction and operation. Project decommissioning and reclamation will not be discussed since the Project has no fixed end of operation.
- Describe activities associated with all components and phases of the Project
- Describe “Early Works” activities, which are Project-related works, such as the Bear Creek Bridge replacement, that will be undertaken prior to the start of Project construction. The description of Early Works activities will include permitting and engagement activities.



# 3 Project Benefits

This section of the Environmental Review Report will describe the anticipated benefits of the proposed Project, including transportation, community, economic, and environmental benefits.

## 3.1 Transportation Benefits

Description of transportation benefits anticipated to result from the Project, including:

- Improved transit accessibility and reliability
- Travel time savings
- Increased transit ridership
- Improved regional connectivity
- Reduced congestion and collisions
- Improved transportation choice south of the Fraser River.

## 3.2 Social and Community Benefits

Description of community benefits anticipated to result from the Project, including:

- Supporting Metro Vancouver's 2040: Shaping our Future (Growth Strategy)
- Progressing towards Surrey Vision *Complete, Connected and Liveable*
- Improved affordability through greater mobility
- Improved safety
- Enhanced urban design features
- Promoting active transportation and associated health benefits.

## 3.3 Economic Benefits

Description of the economic benefits anticipated to result from the Project, including:

- Economic benefits from transportation improvements (e.g. travel time reduction, collision reduction)
- Construction related economic benefits (e.g. jobs and employment income)
- Wider economic benefits (e.g. improved transportation convenience may prompt greater labour force participation).

## 3.4 Environmental Benefits

Description of environmental benefits anticipated to result from the Project, including:

- Improved air quality during operation
- Reduced GHG emissions during operation.

## 4 First Nations Engagement

This section of the ESR report will identify and provide a descriptive overview of First Nations with a potential interest in the Project. The Project is located within, or in proximity to, the traditional territory of the Katzie, Kwantlen, Semiahmoo and Kwikwetlem First Nations as well as the Musqueam Indian Band. TransLink has engaged directly with Katzie, Kwantlen, Semiahmoo and Kwikwetlem First Nations since November 2016 through face-to-face meetings and ongoing correspondence, and intends to engage with Musqueam Indian Band. In addition, the following tribal councils, treaty groups, and associations located outside of Metro Vancouver have been identified through the Consultative Area Database as having interests in the area where the Project is located:

- Hul'qumi'num Treaty Group
- Stó:lō Nation
- Stó:lō Tribal Council.

The Environmental Review Report will describe the approach taken by the Proponent to:

- Provide Project-related and Environmental Review information to potentially-affected First Nations
- Provide opportunities for First Nations to review and comment on key environmental review documents
- Obtain the views of First Nations regarding the Project and the Environmental Review process
- Identify and respond, in a respectful manner, to issues raised by First Nations, including discussions regarding proposed mitigation measures within the Environmental Review Process.

The Environmental Review Report will summarize the Proponent's engagement activities with First Nations by:

- Summarizing Proponent's past and planned engagement activities with First Nations in support of the Environmental Review
- Providing a summary of key issues raised by First Nations regarding the Project and the Environmental Review process along with the Proponent's responses to those issues,
- Summarizing how feedback from First Nations influenced the Environmental Review, and identification of proposed mitigation measures.

The Proponent will also prepare a supporting First Nations Engagement Report to provide additional information regarding the First Nations engagement program.

# 5 Public and Stakeholder Engagement and Information Distribution

The Project has undergone extensive public and stakeholder engagement, including:

**Pre-consultation Engagement (2015)** – Surveys with residents of Surrey and Langley and the broader region confirmed high awareness of the proposed Project, and focus groups with transit and non-transit users confirmed strong support for continued Project development.

**Stage 1: Re-Engagement (December 2016 to February 2017)** - Re-familiarized the public and stakeholders with scope of the Project; confirmed support for the Project as proposed; and identified a high degree of interest in the Project and a desire for additional information.

**Stage 2: Design Consultation (Mid-June to early July 2017)** - First Nations, public and stakeholder feedback was sought on updated Project design elements, including LRT operations and route alignment, and identified preliminary interests with respect to the Environmental and Socio-Economic Review.

**Stage 3: Environmental and Socio-economic Review** - First Nations, public and stakeholder input to the draft terms of reference for the review, and preliminary assessments of potential effects. The full report, including recommended mitigations, enhancements and ongoing requirements, will be available for review and feedback at open houses to be held in in spring 2018. The Environmental Review Report will describe the results of the Public and Stakeholder Engagement Plan including:

- Background Information:
  - Role of the City of Surrey
  - Background information about potentially affected stakeholder groups
- Engagement:
  - A summary of past and planned engagement activities in support of the Environmental Review
  - A description of Project related information made available to the public (e.g., discussion guides, display boards)
  - A summary of changes to the Public and Stakeholder Engagement Plan based on feedback from stakeholders or individuals, or experience from engagement to date
  - A description of the key interests and issues raised by the public that are relevant to the Environmental Review, the responses to those comments, and how the input is being considered.

# 6 Environmental and Socio-economic Review Scope and Methods

This section of the Environmental Review Report will describe the methods used to assess the potential adverse environmental and socio-economic effects of the Project.

## 6.1 Review Scoping and Selection of Review Elements

The Environmental Review Report will describe the process for selecting the various environmental and socio-economic aspects addressed in the review (referred to as “Review Elements”), the metrics used for measuring or describing Project-related changes to the Review Elements, as well as the spatial and temporal boundaries of the review.

### 6.1.1 Selection of Review Elements

The Environmental Review Report will describe how Review Elements were selected. Proposed Review Elements, identified in Table 4 were selected based on:

- Relevant environmental policies, regulations, and guidance
- Potential to be affected by the Project
- What was assessed in similar projects (e.g., Evergreen Line and other recent LRT projects)
- Interests and issues identified by First Nations, stakeholders, and the public.

### 6.1.2 Potential Effects and Selection of Indicators

The Environmental Review Report will include a table identifying potential effects of the Project on Review Elements during Project construction and operations, and indicators used to identify effects for each Review Element. Potential effects will be identified in consideration of information and concerns identified in Section 4 (First Nations Engagement) and Section 5 (Public and Stakeholder Engagement). The review indicators include both metrics used to quantify change and qualitative descriptors used to describe change.

**Table 4: Summary of the Review Elements identified for the SNG project**

Review Element	Rationale for Selection	Spatial Boundaries
Traffic and Transportation	Project construction is expected to disrupt traffic flows Project operations will change traffic patterns in the corridor and adjacent neighbourhoods	City of Surrey communities and travel routes near the Project
Housing, Residential Properties, and Commercial Businesses	The Project may affect land use, housing stock and affordability The Project will affect access to some properties along the corridor Project construction and operation may affect commercial activity for some businesses along the corridor due to traffic disruption and/or change in access	City of Surrey communities and travel routes near the Project.
Community and Emergency Services	Project construction may affect access to, and mobility of emergency service providers and access to community amenities Concerns over safety and security	City of Surrey communities and travel routes near the Project.
Archaeological and Heritage Resources	Project construction may adversely affect archaeological and heritage resources	Within 100 m of the Project centreline
Fisheries and Aquatics	Project could affect freshwater fisheries and aquatic resources during construction and operation	Watercourses located within 100 m of the Project centreline, as well as instream habitat located 300 m downstream of instream works
Vegetation and Wildlife Resources	Project construction may affect urban plantings and green space, plant and wildlife species of interest and their habitat	All urban and green space (including Green Infrastructure Network, parks, street trees, residential areas and other vegetated sites) within 100 m of the Project centreline
Noise	Noise emissions during construction and operation may affect sensitive receptors	Within 300 m of the Project centreline
Vibration	Vibration from construction equipment and activities and LRT operation may affect sensitive receptors	Within 300 m of the Project centreline
Air Quality and GHGs	Project has potential to benefit local and regional air quality during operation phase. GHG emissions contribute to atmospheric GHG levels, and are a policy concern of regional, provincial, and federal governments	City of Surrey Lower Fraser Valley airshed is considered the regional boundary.
Contaminated Sites	Potential for encountering contaminated material during construction	Within 100 m of the Project centreline
Electric and Magnetic Fields	Public concern over effects of potential EMF emissions from the Project's electric components	Within 100 m of the Project centreline and power sub-stations

The Environmental Review Report will provide rationale should any potential Review Elements suggested by government agencies, First Nations, stakeholders or the public during engagement be excluded from the review. Generally, Review Elements may be excluded because of limited presence within the study area or limited potential for Project interactions of concern.

### **6.1.3 Boundaries**

The Environmental Review Report will describe the rationale used in identifying applicable review boundaries, establish a Review Area (i.e., spatial boundary of assessment) for each Review Element and will describe factors that may affect the assessment of Project-related effects. The spatial extent of the Review Areas for each Review Element will consider relevant Project phases, components, and activities.

Table 4 describes proposed spatial boundaries by Review Element.

## **6.2 Baseline Conditions**

Each Review Element will be addressed in a separate section of the Environmental Review Report. The Environmental Review Report will describe existing (or baseline) conditions for each Review Element in sufficient detail to enable review of the potential Project-related interactions that are identified and assessed. Where appropriate, this will include a discussion of anticipated trends, such as changes to conditions related to population growth. The Environmental Review Report will contain technical appendices for Review Elements where appropriate to provide more detailed information on field studies, modelling and analysis, and/or supplementary baseline information. Key findings contained in these technical reports will be summarized in the Environmental Review Report.

## **6.3 Project Interactions**

The Environmental Review Report will summarize the overall process and methods used to identify and assess the potential effects of the proposed Project on the identified Review Elements. This includes a description of potential interactions between the Project and Review Elements, and pathways of consequent effects. Interactions between project activities and potential effects will be identified in a matrix for each Review Element section. The assessment will provide a brief description of the mechanism of each identified interaction between a Project activity or physical work and a Review Element, indicating how it could result in an effect to the Review Element.

## **6.4 Mitigation Measures**

For each Review Element, the Environmental Review Report will describe proposed mitigation measures for managing Project effects on Review Elements. It will also describe key performance measures that will be used to evaluate effectiveness of mitigation measures recommended for construction.

## 6.5 Discussion of Project Effects

The Environmental Review Report will discuss potential Project-related effects for each Review Element, in consideration of the local environmental and socio-economic context, and potential Project interactions, that remain after the application of proposed mitigation measures. Relevant indicators such as magnitude, geographical extent, and duration will be used to describe/characterize the effects. Where effects cannot be characterized quantitatively, they will be described qualitatively.

## 6.6 Conclusions

The Environmental Review Report will present conclusions for each Review Element.

# 7 Assessment of Review Elements

The Environmental Review Report will follow the methodology described in Section 6 for each of the following Review Elements.

## 7.1 Environmental and Socio-Economic Setting

The Environmental Review Report will provide an overview of the environmental and socio-economic setting of the Review Area, including geographical and biophysical features, built environment, and land use. This will include mapping of municipal roads; parks and other public areas, institutions (e.g. schools and hospital); and residential, commercial, and industrial areas.

## 7.2 Traffic and Transportation

The Environmental Review Report will describe the Traffic and Transportation assessment, and the rationale for its selection as a Review Element. Baseline conditions for traffic and transportation will be described as well as potential changes as a result of the Project. This will include a discussion of how the Project will support active transportation modes (e.g., walking, cycling). The Environmental Review Report will also describe how the results of the Traffic and Transportation assessment will be integrated with the analysis of other Review Elements. Table identifies potential effects and review indicators related to traffic and transportation for Project construction and operation phases.

**Table 5: Potential Effects and Review Indicator for Traffic and Transportation**

Topics Included in Assessment	Potential Effects	Review Indicators
Traffic/Congestion Transportation Infrastructure, Community Connectivity	Change in traffic and transportation from baseline due to the Project	<ul style="list-style-type: none"> <li>Roadway description (e.g., number of lanes, traffic flow characteristics)</li> <li>Change in parking</li> <li>Change in accessibility to the corridor and adjacent neighbourhoods</li> <li>Change in vehicle volume (vehicles/day, vehicles-km travelled)</li> <li>Passenger vehicle travel time (selected Origin/Destinations)</li> <li>Transit (travel time, ridership)</li> <li>Pedestrian/cyclist information</li> </ul>



### 7.3 Housing, Residential Properties, and Commercial Businesses

The Environmental Review Report will describe the Housing, Residential Properties, and Commercial Businesses assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Housing, Residential Properties, and Commercial Businesses assessment will be integrated with the analysis of other Review Elements. **Table 6** identifies the potential effects and review indicators for Housing, Residential Properties, and Commercial Businesses for Project construction and operation phases.

**Table 6: Potential Effects and Review Indicator for Housing, Residential Properties, and Commercial Businesses**

Topics Included in Assessment	Potential Effects	Review Indicators
Housing Residential Properties Commercial Businesses	Change in housing, residential properties and commercial businesses from baseline due to the Project	<ul style="list-style-type: none"> <li>• Change in access to properties</li> <li>• Population change</li> <li>• Number and type of residential properties affected by the Project</li> <li>• Housing availability and cost metrics</li> <li>• Number of businesses potentially affected by the Project and description of the anticipated effects</li> </ul>

### 7.4 Community and Emergency Services

The Environmental Review Report will describe the Community and Emergency Services assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Community and Emergency Services assessment will be integrated with the analysis of other Review Elements. **Table 7** identifies the potential effects and review indicators for Community and Emergency Services for Project construction and operation phases.

**Table 7: Potential Effects and Review Indicator for Community and Emergency Services**

Topics Included in Assessment	Potential Effects	Review Indicators
Infrastructure and Services Public Safety and Security	Change in emergency access, community amenities, and public safety from baseline due to the Project	<ul style="list-style-type: none"> <li>• Public access to emergency services (qualitative)</li> <li>• Emergency medical services, fire rescue, and police response routes (qualitative)</li> <li>• Potential change in public safety and security</li> <li>• Changes to community infrastructure, services and amenities, including parks and green space</li> </ul>

### 7.5 Archaeological and Heritage Resources

The Environmental Review Report will describe the Archeological and Heritage Resources assessment, and the rationale for its selection as a Review Element. An Archeological Overview Assessment will be completed in accordance with provincial guidance. The Environmental Review Report will also describe how the results of the Archeological and Heritage Resources assessment will be integrated with the analysis of other Review Elements. **Table** identifies the potential effects and review indicators for archaeological and heritage resources for the Project construction phase.

**Table 8: Potential Effects and Review Indicator for Archaeological and Heritage Resources**

Topics Included in Assessment	Potential Effects	Review Indicators
Archaeological sites	Alterations to archaeological site contents or context (known and unknown sites) and areas with archaeological potential	<ul style="list-style-type: none"> <li>Number and description of archaeological sites with potential to be altered as a result of Project activities</li> <li>Areas with high archaeological potential that could be affected by the Project</li> </ul>
Heritage sites	Alterations to heritage buildings, landscapes, or other sites of heritage value (known and unknown sites)	<ul style="list-style-type: none"> <li>Number and description of heritage sites with potential to be altered as a result of Project activities</li> </ul>

## 7.6 Fisheries and Aquatic Resources

The Environmental Review Report will describe the Fisheries and Aquatic Resources assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Fisheries and Aquatic Resources assessment will be integrated with the analysis of other Review Elements. Table identifies potential effects and review indicators related to fisheries and aquatic resources for Project construction and operation phases.

**Table 9: Potential Effects and Review Indicator and Spatial Boundaries for Fisheries and Aquatic Resources**

Topics Included in Assessment	Potential Effects	Review Indicator
Fish Habitat	Change in fish habitat from baseline due to the Project	<ul style="list-style-type: none"> <li>Net changes (losses and gains) (m<sup>2</sup>) to instream habitat</li> <li>Net changes (losses and gains) (m<sup>2</sup>) to riparian habitat</li> </ul>
Fish Mortality or Health	Change in fish mortality or health	<ul style="list-style-type: none"> <li>Potential for mortality risk (all life stages) due to extent, duration, or timing of instream works; changes in water quality (including changes in Total Suspended Solids)</li> </ul>

## 7.7 Vegetation and Wildlife Resources

The Environmental Review Report will describe the Vegetation and Wildlife Resources assessment, and the rationale for its selection as a Review Element including vegetation and wildlife specific regulatory requirements. The Environmental Review Report will also describe how the results of the Vegetation and Wildlife Resources assessment will be integrated with the analysis of other Review Elements. Table identifies potential effects and review indicators related to vegetation and wildlife resources for Project construction and operation phases.

**Table 10: Potential Effects and Review Indicators for Vegetation and Wildlife Resources**

Topics Included in Assessment	Potential Effects	Review Indicators
Species and Ecosystems of Management Concern	Change in abundance of species of management concern from baseline due to the Project	<ul style="list-style-type: none"> <li>• Change to potential occurrence of species at risk (plant and animal)</li> <li>• Change to potential occurrence and locations of invasive species (plant and animal)</li> <li>• Areal extent of provincially-listed ecological communities at risk and wetlands</li> </ul>
	Change in abundance of ecological communities or abundance/quality of wildlife habitat from baseline due to the Project	
Green Space	Change in quantity, quality, or connectivity of green space from baseline due to the Project	<ul style="list-style-type: none"> <li>• Change in habitat availability for focal species at risk</li> <li>• Change in the availability of wildlife habitat features</li> <li>• Areal extent of forest canopy cover</li> <li>• Areal extent of Green Infrastructure Network elements and potential for changes to connectivity</li> <li>• Areal extent of permeable and impermeable surfaces</li> <li>• Change in number and type of trees within the Project alignment, including heritage or protected trees</li> </ul>
Mortality Risk	Change in injury or mortality of wildlife from baseline due to the Project	<ul style="list-style-type: none"> <li>• Potential for injury or mortality risk to wildlife due to extent, duration or timing of construction and operation activities</li> </ul>

## 7.8 Noise

The Environmental Review Report will describe of the Noise assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Noise assessment will be integrated with the analysis of other Review Elements. Table identifies potential effects and review indicators related to noise for Project construction and operation phases.

**Table 11: Potential Effects and Review Indicators and Spatial Boundaries for Noise**

Topics Included in Assessment	Potential Effects	Review Indicators
Construction noise Operational noise	Change in Noise Levels	<p>Predicted noise level during construction and operation phases quantified using the following parameters compared to noise baseline:</p> <ul style="list-style-type: none"> <li>• Daytime and night time equivalent sound level (Ld and Ln) in dBA</li> <li>• Hourly equivalent sound level (Leq [1 hour]) in dBA</li> <li>• Day-Night sound level (Ldn) in dBA</li> <li>• 24-hour equivalent sound level (Leq [24 hours]) in dBA</li> </ul>

## 7.9 Vibration

The Environmental Review Report will describe the Vibration assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Vibration assessment will be integrated with the analysis of other Review Elements. Table 12 identifies potential effects and review indicators related to vibration for construction and operation.

**Table 12: Potential Effects and Review Indicators and Spatial Boundaries for Vibration**

Topics Included in Assessment	Potential Effects	Review Indicators
Construction vibration Operational vibration	Change in Vibration Levels	<p>Predicted ground vibration levels at specific receptors during construction and operation phases quantified using the following parameters compared to vibration baseline:</p> <ul style="list-style-type: none"> <li>• Peak particle velocity (PPV) in mm/s</li> <li>• Room mean square (RMS) velocity in mm/s</li> </ul> <p>Predicted vibration levels will be presented in context of potential effects to receptors (e.g. human perception, building damage)</p>

## 7.10 Air Quality and Greenhouse Gases

The Environmental Review Report will describe the Air Quality and Greenhouse Gases assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Air Quality and Greenhouse Gases assessment will be integrated with the analysis of other Review Elements. Table identifies potential effects and review indicators related to air quality and greenhouse gases for Project construction and operation phases.

**Table 13: Potential Effects and Review Indicators for Air Quality and Greenhouse Gases**

Topics Included in Assessment	Potential Effects	Review Indicators
Ambient concentrations of CACs	Change in the ambient concentration of CACs from baseline due to the Project	<ul style="list-style-type: none"> <li>• Estimated change in emissions of CACs (SO<sub>2</sub>, NO<sub>2</sub>, CO, PM<sub>10</sub>, PM<sub>2.5</sub>, VOCs) relative to ambient CACs (PM<sub>2.5</sub>)</li> </ul>
Emissions of GHGs	Emissions of GHGs from baseline due to the Project	<ul style="list-style-type: none"> <li>• Estimated changes in emissions of GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, reported as CO<sub>2e</sub>)</li> </ul>

## 7.11 Contaminated Sites and Excavated Materials

The Environmental Review Report will describe the Contaminated Sites assessment and the rationale for its selection as a Review Element. The Environmental Review will also address disposal options for excavated materials and describe how the results of the Contaminated Sites assessment will be integrated with the analysis of other Review Elements.

The contaminated sites assessment will focus on the effects of disturbance to contaminated sites during Project construction, as well as handling/removal/disposal of excavated materials. Table identifies potential effects and review indicators related to contaminated sites and excavated materials for Project construction phase.

**Table 14: Potential Effects and Review Indicators for Contaminated Sites and Excavated Materials**

Topics included in Assessment	Potential Effects	Review Indicators
Contaminated soils	Release of contaminants from contaminated soils or water encountered during construction	<ul style="list-style-type: none"> <li>Existence and location of contaminated sites</li> <li>Nature of contaminated materials</li> </ul>
Excavated Materials	<p>Appropriate removal and disposal of excavated materials and demolition waste is a management concern</p> <p>Potential for dust generation and sedimentation from storage and handling of materials during construction</p>	<ul style="list-style-type: none"> <li>Nature of excavated materials and disposal waste</li> </ul>

## 7.12 Electric and Magnetic Fields

The Environmental Review Report will describe the Electric and Magnetic Fields assessment and the rationale for its selection as a Review Element. EMFs will be considered in the context of national and international criteria and objectives. The Environmental Review Report will also describe how the results of the assessment of Electric and Magnetic Fields will be integrated with the analysis of other Review Elements. Table identifies potential effects and review indicators related to electric and magnetic fields for Project construction and operation phases.

**Table 15: Potential Effects and Review Indicators for Electric and Magnetic Fields**

Topics included in Assessment	Potential Adverse Effects	Review Indicators
EMF Effects	Change in EMF levels from baseline due to the Project	<p>Potential change in EMF during construction and operation phases due to the Project (including the OMF, vehicles and control systems) using the following parameters compared to baseline:</p> <ul style="list-style-type: none"> <li>Electric field (V/m)</li> <li>Magnetic field (mG)</li> <li>Stray current</li> </ul>

## 8 Accidents, Malfunctions, and Natural Hazards

Accidents and Malfunctions will be considered primarily from a public safety perspective and will include:

- Identification of potential accident and malfunction scenarios during Project construction and operation, such as:
  - Fire on train or auxiliary facilities
  - Fuel leak or spill
  - Electrical disruptions
  - Train derailment
  - Collision
- The methodology for assessing the potential risk of an event (likelihood and consequence)
- Identification of proposed measures to reduce the likelihood of the event
- Conclusions on the potential risk of the accident or malfunction to relevant Review Elements.

The Environmental Review Report will include consideration of natural hazards:

- Identification of possible environmental factors that could affect the Project such as:
  - Seismic events
  - Extreme weather events (wind storms; heavy rain and/or snow)
- A description of any changes or effects on the Project due to environmental factors
- The likelihood and consequence of the changes or effects to relevant Review Elements (e.g., in the context of climate change)
- Practical mitigation measures, including design strategies and environmental contingency plans, to avoid or minimize the likelihood and consequence of natural hazards
- A conclusion about the potential risk of natural hazards to Review Elements.

## 9 Environmental Management Plans

The Environmental Review Report will include:

- An outline for a Construction Environmental Management Plan of the proposed Project which will include at a minimum, the following plans:
  - Environmental Monitoring Plan
  - Erosion and Sediment Control Plan
  - Fish and Fish Habitat Plan
  - Site Restoration Plan
  - Traffic Management Plan
  - Access Management Plan
  - Spill and Emergency Response Plan
  - Vegetation and Wildlife Management Plan

- Contaminated Soil and Water Management Plan
- Air Quality and Dust Control Management Plan
- Noise and Vibration Management Plan
- Construction and Waste Management Plan.
- A list of applicable licenses, permits and/or approvals that are already received or potentially required for Project Early Works and construction, and the associated responsible regulatory body.
- An outline for an Operational Environmental Management Plan that will include monitoring and inspection requirements to manage environmental performance.
- Each Management Plan will describe performance objectives, and associated mitigation measures intended to meet those performance objectives.
- Reference other plans and programs relevant to environmental management (e.g., a landscape plan, community liaison programs).

## 10 Summary and Conclusion

The Environmental Review Report will:

- Summarize potential Project effects in a table format that describes the potential effect, Project phases, Project activity or physical work linked to the effect.
- Summarize performance objective and proposed mitigation measures to avoid or reduce potential adverse project effects on environmental and socio-economic values.
- Outline the minimum requirements for environmental management plans.
- Provide conclusions on overall environmental and socio-economic effects of the Project.
- Identify next steps, including development of environmental management plans and Table of Project Environmental Requirements.

## 11 References

The Proponent will provide a list of reference material used in developing the Environmental Review Report. Below is a list of materials used to develop the Terms of Reference.

British Columbia Environmental Assessment Office. 2013. Guideline for the Selection of Valued Components and Assessment of Potential Effects. Available at:  
[http://www.eao.gov.bc.ca/VC\\_Guidelines.htm](http://www.eao.gov.bc.ca/VC_Guidelines.htm).

British Columbia Environmental Assessment Office. August 2015. Application Information Requirements Template. Available at: <http://www.eao.gov.bc.ca/guidance.html>.



